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van Uden, Annelies; Knobens, Joris; Vermeulen, P.A.M.

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Making sense of industry characteristics as drivers of dynamic capabilities

Annelies van Uden¹

a.vanuden@fm.ru.nl

Joris Knobén

j.knoben@fm.ru.nl

Patrick Vermeulen

p.vermeulen@fm.ru.nl

Radboud University Nijmegen

Institute for Management Research

P.O. Box 9108

6500 HK Nijmegen

The Netherlands

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¹ Please send all comments to the first author.

INTRODUCTION

Since the seminal work of Teece and Pisano (1994) the dynamic capabilities (hereafter DCs) approach has emerged as one of the most important approaches to explain competitive advantages of firms (Di Stefano, Peteraf, & Verona, 2014; Easterby-Smith, Lyles, & Peteraf, 2009). DCs have been defined as “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece, Pisano and Shuen, 1997: 517). These DCs cannot be bought, but must be build and developed within a firm (Katkalo, Pitelis, & Teece, 2010). Several explanations have been given why some firms are better equipped with DCs than others. These explanations consider mainly the internal factors that are conducive for the development of DCs, also called second-order dynamic capabilities (Collis, 1994; Danneels, 2008; Schilke, 2014a). Important elements of second-order dynamic capabilities are internal learning mechanisms, experience and routines (Schilke, 2014a; Zahra, Sapienza, & Davidsson, 2006; Zollo & Winter, 2002). Yet, these explanations do not take into account how the environment in which the firm is active spurs the development of DCs. It seems likely, however, that environmental characteristics matter for the development of DCs as well, as it gives an incentive to firms to develop DCs.

Previous studies suggest that DCs are the result of co-evolution of internal and external forces (Jacobides & Winter, 2011; Li & Liu, 2014a; Teece, 2007). The external environment gives a stimulus to develop DCs. In an environment characterized by change, unpredictability and uncertainty, a firm will be more inclined to develop DCs. However, there is a lack of detailed knowledge about how the external environment exactly drives the development of DCs. The few studies that empirically studied how the external environment leads to the development of DCs only considered ‘environmental dynamism’ in relation to DCs (e.g. Schilke, 2014; Teece et al., 1997). Yet, previous research about the development of DCs in different types of environments is far from conclusive (Barreto, 2010). One view, based on the work of Teece et al. (1997), argues that DCs are especially valuable in dynamic environments, in which a firm has to adjust its resource base frequently to stay competitive. The main focus of this research is how

firms can stay competitive in a rapidly changing market (Peteraf, Di Stefano, & Verona, 2013). The other view is based on the work of Eisenhardt & Martin (2000) arguing that DC 'become difficult to sustain in high-velocity markets' (p.1113), indicating that the 'sustainability of the capabilities themselves varies with the dynamism of the market' (p.1113). Thus, they argue that DCs are especially valuable in less dynamic environments and that in more dynamic environments a firm will rely on simple rules to respond flexibly (Di Stefano et al., 2014). Peteraf et al. (2013) called this the boundary condition of DCs, which indicates in what kind of environments DCs are applicable.

Furthermore, much of the existing literature about the role of the environment and DCs ignores other industry characteristics (Barreto, 2010). This is problematic, because other industry characteristics have been identified to influence strategic decision making (Aldrich, 1979; Aragón-Correa & Sharma, 2003; Dess & Beard, 1984) and refer to uncertainty within the environment. Dynamism is an important element, which creates uncertainty, but it is not the only factor that causes a need for firms develop DCs. Heterogeneity and complexity also create uncertainty within an environment (Dess & Beard, 1984). Hence, it could as well be that these industry characteristics confound with dynamism. If the environment is not conceived solely as dynamic and the other characteristics are used to understand the uncertainty of the industry, this might reconcile the contradictory views between Eisenhardt & Martin (2000) and Teece et al. (1997). Hence, we expect that these aspects will incentivize firms to develop DCs in order to be able to respond to their environment, especially when there is high uncertainty.

The aim of this paper is to contribute to this debate by not only considering dynamism in the environment but also other environmental characteristics. We analyze how different industry characteristics, which refer to uncertainty of the environment, drive the development of DCs of firms. This contributes to the little systematic evidence on whether firms develop different levels of DCs due to the environment in which they are active. We focus specifically on the capability of a firm to identify the need and opportunity to change (cf. Teece (2007)). This DC refers to the ability of a firm to identify and select information about opportunities within the environment. It reflects the extent to which the firm

observes and is aware of the environment. An example of activities that a firm could undertake relating to sensing are monitoring and scanning of firms, universities and other organizations in the region in which the firm is active. This gives the firm information about locally residing knowledge that could be valuable for the firm (Danneels, 2008) as well as scanning and monitoring of customer needs (Teece, 2007). We focus specifically on this DC, because this DC has the strongest link with the environment.

These issues are examined empirically in three developing countries. Most research about DCs take place in developed countries and some studies have considered transition economies. However, studies about DCs in developing countries are missing. We examine how these different industry characteristics influence the level of DCs of small and medium sized manufacturing firms in three developing countries. Previous research suggest that external factors are relatively more salient for firms in developing countries compared to developed countries, because developing countries are more heterogeneous in their environmental settings (Makino, Isobe, & Chan, 2004). For instance, market mechanisms within developed countries are more integrated and therefore internal mechanisms are more important, while in developing countries market mechanisms are less developed and integrated. This results in more variation and a bigger impact of external factors upon a firm. Hence, the variation in environmental characteristics makes developing countries an interesting case to study the relationship between the environment and DCs. We focus specifically on small and medium sized enterprises (SMEs) in the East African region; Kenya, Tanzania and Uganda. We focus specifically on SMEs, because external stimuli have a greater impact on SMEs than on larger firms (Barnett, 1997). SMEs have fewer buffers, which makes it more difficult to deal with the uncertainty than for larger firms, which suggests that DCs are even more important.

THEORETICAL BACKGROUND

Dynamic capabilities

The dynamic capabilities framework has been seen as an extension of the resource-based view. The resource-based view considers firm's existing resources that are valuable, rare, inimitable and non-substitutable as the main component of competitive advantage (Barney, 2001). The dynamic capabilities approach originated in the work of Teece and Pisano (1994) who proposed a framework in which a firm's competitive advantage was determined by managerial and organizational processes, specific asset positions and paths available to a firm. DCs give firms the ability to change and recreate its resource-base, which may give the firm a competitive advantage compared to its competitors in changing environmental conditions (Teece, Pisano, & Shuen, 1997). Hence, the DC approach addresses the importance of changing the existing resource-base of a firm in order to stay competitive.

Two competing views upon what DCs exactly are evolved in the literature (Di Stefano et al., 2014; Peteraf et al., 2013). The main distinction between the two views concerns the relationship between the level of dynamism within the environment and DCs. The line of thought that originated in the work of Teece et al. (1997) argues that DCs are complex routines that are of particular value in rapidly changing environments. The other stream of literature, based on the work of Eisenhardt and Martin (2000), states that DCs cannot sustain in dynamic environments and that firms have to rely on simple rules in such an environment (Di Stefano et al., 2014). However, both streams of literature have focused mainly on dynamism within the environment and used the environment as a moderating factor on the relationship between DCs and performance. For instance, Schilke (2014b), using data from 279 firms, shows that DCs are more strongly associated with a competitive advantage in moderately dynamic environments. Karna et al. (2015) conducted a meta-analysis, which indicated that DCs and performance have a stronger relationship in more dynamic environments. Yet, it is still unclear in what kind of environments DCs will be developed (Barreto, 2010).

Uncertainty and industry characteristics

An environment may give an incentive to develop new capabilities, because the need to have DCs in some environments may be higher than in others. Environments in which strategic flexibility is necessary create a need for firms to develop capabilities. In particular, uncertain environments challenge firms to develop DCs, because in these environments changes occur to which a firm responds more easily if it has DCs. For instance, a volatile environment characterized by change gives a firm that is aware of this changing environment the need to reconfigure its resource base in order to stay competitive.

Uncertainty within the environment has been defined as the inability to ‘accurately assess the external environment of the organization or the future changes that might occur in that environment’ (Dickson & Weaver, 1997, p. 405). According to the literature about environmental constructs three key dimensions exist and two of them relate to uncertainty (Aldrich, 1979). Previous studies on industry characteristics differ in the way they conceptualize these contextual factors (Aldrich, 1979; Dess & Beard, 1984). Yet, Dess and Beard (1984) identified three different key constructs, which are munificence, dynamism, complexity. These key constructs have been used extensively in previous studies (Bakker & Knoben, 2014; Chen, Zeng, Lin, & Ma, 2015; Keats & Hitt, 1988). Moreover, they are particularly useful for our research, because two of these constructs identify the uncertainty of the environment. Dynamism refers to how static or dynamic an environment is, while complexity relates to how simple or complex the environment is. Munificence is the third element of the environment and refers to the capacity of the environment, but it is not associated with uncertainty (therefore, we only use it as a control variable).

Hypotheses

Environmental dynamism

Environmental dynamism refers to the volatility in the environment that a firm faces, which is indicated by the deviation from the trend growth in the industry (Dess & Beard, 1984). Dynamism consists of two

dimensions, the quantum of change and the rate of change (Miles et al., 1974). The quantum of change refers to the magnitude of change within the environment: the bigger the magnitude of the change, the more uncertainty this generates for the organization (Bakker & Knobens, 2014; Koka et al., 2006). The rate of change refers to how frequent change occurs (Bakker & Knobens, 2014; Koka et al., 2006). Although the quantum and rate of change are caused by different mechanisms, both aspects result in uncertainty due to the instability in the environment (Bakker & Knobens, 2014; Dess & Beard, 1984). It is this instability that creates an incentive for firms to develop DCs in order to deal with the uncertainty. In an environment characterized by volatility, firms have to respond to this dynamism in order to stay competitive (Aldrich, 1979; Zahra et al., 2006).

We expect that a dynamic environment reduces the potential value of the resource base and a firm's competitive position (Drnevich & Kriauciunas, 2011; Li & Liu, 2014; Wang & Ang, 2004). In such a dynamic environment, flexibility is key (Tallon, 2008) and DCs gives a firm the flexibility to adjust its resource base in order to deal with instability and uncertainty (Chmielewski & Paladino, 2007; Eisenhardt & Martin, 2000; Helfat et al., 2007; Winter, 2003). In an environment characterized by change and instability, firms should closely observe what happens in the environment in order to be able to respond adequately. In this reasoning it is implicitly assumed that a dynamic environment requires firms to respond by changing its resource base (Drnevich & Kriauciunas, 2011). However, it could be that dynamism does not require a firm to adapt its resource base, but to use its resource base more efficiently (Miller and Friesen, 1983; Helfat et al., 2007). Yet, if that is the case, DCs are also necessary in order to use the resource base to become more efficient. As such, a firm should be able to sense that it should produce more efficiently and it should be able to identify how it can pursue this goal.

In a more stable environment, it is less useful to develop this DC, because if no changes occur it is easier to understand the environment and less necessary to monitor the environment closely. Moreover, DCs are probably too expensive to develop and could be even destructive considering the cost involved by building and using them (Li & Liu, 2014; Schreyögg & Kliesch-Eberl, 2007). This indicates that this

DC is more necessary in a dynamic environment. Summarizing, dynamism creates a need for firms to develop sensing capabilities in order to be better able to deal with instability and uncertainty in the market. Hence, we propose the following hypothesis:

H1: *The higher the level of dynamism within a firm's industry, the higher the level of DCs of that firm.*

Environmental complexity

Environmental complexity consists of two components: heterogeneity and concentration. Heterogeneity refers to the dissimilarity of inputs and outputs required by an industry (Boyd, 1990). Concentration refers to the density of firms within the same industry (Boyd, 1990). We expect that both elements influence the need to have DCs, because both elements reflect a level of uncertainty. In order to deal with this uncertainty, a firm should develop DCs to respond adequately.

Heterogeneity

Heterogeneity results in complexity, because a more heterogeneous environment is characterized by dissimilarity of inputs and outputs used by a firm (Dess and Beard 1984). This dissimilarity of inputs and outputs raises uncertainty, because it is burdensome to obtain all relevant information for the firm. Such an environment is characterized by many interactions and inter-organizational connections (Chen et al., 2015). This raises a challenge for a firm to make the right strategic decision (Dess & Beard, 1984), because it is more difficult to monitor the environment (Boyd, 1990). Thus the higher the heterogeneity within an industry, the higher the uncertainty. Hence, such an environment creates an incentive for firms to develop sensing capabilities, which will support firms in collecting relevant information and reducing uncertainty.

Furthermore, in a more dissimilar environment, there will be more sources that contain information relevant for the firm, due to the dissimilarity of inputs and outputs used by a firm. A

heterogeneous environment consists of a more diverse pool of potential resources. A more diverse pool of resources creates a lower incentive to stay committed to your own resource base, because there are more resources that a firm could incorporate and use to adjust its resource base. This will drive the development of sensing capabilities, because this will help the firm to identify and select resources valuable for the firm. Hence, we expect that:

H2: The higher the level of heterogeneity within a firm's industry, the higher the level of DCs of that firm.

Concentration

A second component of complexity is concentration (Dess & Beard, 1984), which refers to the degree in which resources are either evenly distributed or concentrated within the industry (Aldrich, 1979). It has been seen as the competition in the industry (Boyd, 1990). Several studies indicate that there exists an inverted U-shaped relationship between concentration and uncertainty (Scherer, 1980). At very low levels of concentration (perfect competition) there are an infinite number of firms and all these firms have a small market share. This results in an environment that is easy to understand and where all firms are price takers, which results in less uncertainty (Scherer, 1980). The other end of the range of competition is an environment in which concentration is really high, resulting in an environment characterized as a monopoly in the most extreme case. In such an environment it is easy to understand the environment and know your competitors, which results in low uncertainty. At moderate levels of competition uncertainty will be high, because there are numerous competitors, which makes it more difficult to have all information, which creates uncertainty. However, most environments are not characterized by perfect competition or a monopoly. Therefore, we focus on concentration levels between moderate concentration to highly concentrated markets. Within this range, we expect that the lower the concentration, the higher the uncertainty, which creates a higher need to develop DCs. We expect that this holds in particular for

SMEs, because they often face fierce competition and have to adapt constantly to stay competitive (Acs & Audretsch, 1988).

The key argument is that lower concentration creates higher uncertainty, because it becomes increasingly difficult to understand the environment. It becomes more difficult to identify competitors and to determine how to deal with these competitors and create value for clients when competition increases (Sirmon et al., 2007). In such an industry, it is more ambiguous what kind of information is needed to maintain or develop a competitive advantage (Sirmon et al., 2007) and change the resource base accordingly. Therefore it becomes more difficult to monitor the environment and select the information useful for the firm. Furthermore, it creates a market in which firms continuously seek for new opportunities in order to stay competitive, because there is more rivalry (Acs & Audretsch, 1988). The speed and accuracy of the adaptation of firms within such an industry is crucial (Adler et al. 1999). Finally, in a more competitive industry, there is even a higher chance of losing customers (Lusch & Laczniak, 1987; Wilden, Gudergan, Nielsen, & Lings, 2013), which makes it valuable to monitor customers. This provokes a need to develop sensing capabilities in order to be flexible and deal with this uncertainty and rivalry and change the resource base accordingly (Auh & Menguc, 2005; Sirmon et al., 2010; Wilden et al., 2013). Hence, we expect that in an environment with a higher level of competition, sensing capabilities will be higher. This results in the following hypothesis:

H3: The higher the competition within a firm's industry, the higher the level of the DCs of that firm.

METHODOLOGY

To test the relationship between the different industry characteristics and the DC sensing, we used data of SMEs in the manufacturing sector in three developing countries, namely Kenya, Tanzania and Uganda. We focus on SMEs, because they are conducive for economic activity and innovation (Mulhern, 1995).

Furthermore, especially SMEs are more sensitive to the environment (Barnett, 1997), because they have less resources to control the environment. We chose the manufacturing sector, because in particular in developing countries, manufacturing is an important sector. It has been a sine qua non of structural economic change and development ever since the Industrial Revolution, yet in developing countries the manufacturing sector has been shrinking or is stagnant (Bigsten & Söderbom, 2006).

Data

The quantitative data that we used to test our theoretical ideas stems from several sources, we used data from several different surveys collected by the World Bank and input-output tables taken from 'Global Trade Analysis Project' conducted by the Purdue University. This resulted in a unique dataset to test our ideas.

We used the Enterprise Surveys 2007 and 2013 and the Innovation Capabilities Survey 2015 conducted in Kenya, Tanzania and Uganda. The Enterprise Surveys have been developed by the World Bank to collect harmonized data among developing countries. Since 2002, the World Bank has conducted interviews with top managers and business owners of 130,000 firms in 135 economies. The goal of the survey is to get an overview of a broad range of topics, such as finance, corruption, infrastructure, crime, competition and performance. We used the Enterprise surveys of 2006/7 and 2013 to measure our independent variables, except for heterogeneity. To measure heterogeneity, we used input-output tables constructed by the 'Global Trade Analysis Project' conducted by the Purdue University, stemming from 2007. We used the Innovation Capabilities Survey of the World Bank to measure our independent variable, the DC sensing. The aim of the Innovation Capabilities Survey of 2015 is to get a better understanding of the innovative activities and capabilities of manufacturing firms. The survey gives us exceptional data about capabilities in these three developing countries. An overview of the data sources used to measure each variable is provided in table 1.

The World Bank uses stratified random sampling as sampling methodology. The strata for the Enterprise Survey have been based on firm size, business sector (manufacturing and services) and geographic region within a country.² The sample for the Innovation Capabilities Survey is a subsample of the Enterprise Survey sample and is drawn from manufacturing firms only. This increases the comparability of firms within our sample. In total 484 firms have been surveyed in our sample, 201 from Kenya, 136 from Tanzania and 147 located in Uganda. There is a two-year interval between the surveys. The advantage is that our dependent variable has been measured two years after our independent variables. Moreover, we avoid potential problems due to common method bias, because we used separate sources of data for our dependent and independent variables (Podsakoff, MacKenzie, & Lee, 2003).

Dependent variables

Dynamic capability: Identification & Selection. We measured the dynamic capability Identification & Selection with responses to statements in which the establishment indicated how much they agreed with the statements. The response was measured with a 7-point-likert-scale, ranging from completely disagree to completely agree. Several different statements were used to measure identification and selection. The items used to measure the DC are taken from previous studies. We used three items from Danneels' (2008) environmental scanning scale. We combined these items with two items related to selection. One item indicates if a firm monitors the needs of clients and customers and one item about technology monitoring within the firm, based on Radas & Božić (2009). All the items together denotes the firm's ability to identify and select information that is valuable for the firm, because it indicates if a firm is aware of the knowledge/technologies that are relevant for the market and fits within the firm. See table 1 for an overview of the statements. The average of the standardized scores of all these items together indicates the level of sensing capabilities of a firm. The reliability of the scale is $\alpha = 0,71$ which conforms to the accepted level of at least 0.70 (Nunnally, 1978).

² For more information about the methodology and sampling see: www.enterprisesurveys.org.

Independent variables

Data about the environment of SMEs in our sample were aggregated from the Enterprise Surveys of 2007 and 2013 and input-output tables and linked to the primary survey data about the DC. We aggregated the data to the industry level, related to the industries present in the Innovation Capabilities Survey. Unfortunately, we did not have data about the total industry, therefore we had to rely on the data available within the sample of the surveys and used this to get industry averages by aggregating the data to the industry level. The industries were matched with the industries mentioned in the Innovation Capabilities Survey of 2015.

Dynamism was operationalized by the standard error of the regression slope divided by the mean value of sales (Bradley, Aldrich, Shepherd, & Wiklund, 2011; Dess & Beard, 1984). To measure dynamism, we first needed a measure of the trend growth within the industry, for which we used the measure of munificence. Munificence is measured as the coefficient resulting from regressing time against the industry sales divided by the mean value of the industry sales, using sales of four years as indicated in the Enterprise Survey of 2007 and 2013 (see for more information the explanation of the control variable ‘munificence’). The higher the score on dynamism, the higher the volatility within that industry. This measurement is similar as in previous studies (e.g. Goll & Rasheed, 2004; Nielsen & Nielsen, 2013). For example, in Tanzania, the garments industry has the lowest score on dynamism while wood and furniture have the highest score. Thus the garment industry is not so volatile, which seems logical because garment seems to be an industry that produces goods that consumers need anyway. So, it will not be really volatile referring to a relatively predictable environment. The wood and furniture industry is lot more volatile. Probably, wood and furniture are products that are more sensitive to changes within the economy. Consumers will be more inclined to save on furniture than on basic goods such as clothing. Thus it seems logical that the wood and furniture is more dynamic than the garment industry.

Heterogeneity is the extent to which industries require many different inputs and outputs (Dess & Beard, 1984). We used input-output tables constructed by the Global Trade Analysis Project of the Purdue University based on 2007 for the three countries and distinguished between different industries, related to the industries as mentioned in the Innovation Capabilities Survey of 2015. Input heterogeneity was calculated by the Herfindahl index of the value of purchases of inputs of other industries by an industry. Output heterogeneity was determined by computing the Herfindahl index of the value of the industry sales to other industries. In line with previous research (f.i. (Bakker & Knoben, 2014)), we calculated the final score of both measures by 1 minus the Herfindahl value to ascertain that a higher score indicates a higher level of heterogeneity. In order to have one measurement for heterogeneity, we took the average of both scores. A good example of industry scoring high on heterogeneity is the machinery industry in Kenya. Most industries rely in some sort of way on machinery, which explains the high score on output heterogeneity. The high score on input heterogeneity indicates that the industry uses a lot of different inputs to produce the machinery.

Concentration refers to the density of firms within the same environment (Boyd, 1990). We constructed a variable that indicates which amount of firms within an industry indicated that the number of competitors were too many to count. If a firm indicated that the number of competitors was too many to count, we coded it as one. We then computed the share of firms within the total industry that gave this answer and used it as our measurement for concentration. For example, the furniture industry in Uganda has the highest score on this variable, indicating that there are a lot of competitors in this industry. This score reflects all the small shops that sell furniture within the same street, which result indeed in a high level of competition and hence a low level of concentration.

Control variables. In addition to the industry level variables, we controlled for the following firm level factors: firm age, firm size, foreign ownership, R&D, training and munificence.

Firm age. The age of a firm has been indicated as a factor that influences the development of dynamic capabilities (Helfat & Peteraf, 2003). Moreover, older firms are less flexible (Hansen, 1992) and will therefore react differently on changes within the environment. Firm age was measured as the natural logarithm of the number of years that the firm exists, determined by asking for the establishment year of the company and subtracting this from the year in which the survey was performed.

Firm size may influence the development of DC and the way in which the firm deals with its environment. Larger firms have more resources to develop and change their routine and it may influence the need for external resources available within the environment (Barnett, 1997). We measured size as the natural logarithm of the total number of full time employees within the firm.

Foreign ownership. We used a question about the percentage of the company that is owned by private foreign individuals, companies or organizations to construct the control variable. For any company that answered any value greater than 0% to the above question we coded the control variable 'foreign ownership' as '1' and '0' otherwise. We control for foreign ownership because firms in emerging economies often highly benefit from technological knowledge available from their international headquarter and research labs (Isobe et al., 2000), which gives them a better opportunity to develop DCs and deal with the external environment.

R&D gives the firm the capacity to generate and process knowledge and to absorb external knowledge (Cohen & Levinthal, 1989; Rothaermel & Hess, 2007). This influences the ability of a firm to develop DCs and the ability to deal with the environment. Therefore, we included a dummy variable, taken the value of '1' if the firm indicated to spend money on R&D in the last three years.

Training enhances learning and increases the general skills and abilities that employees have, which is pivotal for the development of DCs (Easterby-Smith & Prieto, 2008; Felin, Foss, Heimeriks, & Madsen, 2012; Sirmon et al., 2007; Zollo & Winter, 2002) and the ability of the firm to deal with the environment. Therefore, we include a dummy variable based on the question: "*In the last fiscal year did*

your company offer formal training programs to your full-time permanent employees?’. Companies that answered with yes were coded with ‘1’ , all other companies with ‘0’.

Munificence. Following Boyd (1990) we measured munificence as the coefficient resulting from regressing time against the industry sales divided by the mean value of the industry sales. We estimated the munificence for each industry in each country separately using the Enterprise Survey of 2007 and 2013. In both surveys, firms were asked to indicate their sales for the last fiscal year and three fiscal years ago. We used the sales information from these four different data points in time. For instance, for Uganda we used sales data of 2002, 2005, 2009 and 2012. We aggregated this information to the industry level and estimated the growth in sales per industry between these four data points. This procedure is in line with the method that has been used in previous studies (e.g. Bradley et al., 2011; Dess & Beard, 1984; Goll & Rasheed, 2004; Nielsen & Nielsen, 2013).

Data analysis

We estimated regression models with the DC sensing as dependent variables. The dependent variable is normally distributed, therefore we used OLS regression techniques to estimate our results. Our independent variables could possibly suffer from correlation of errors within industries. Therefore, we accounted for clustered standard errors, when we ran the regressions. Our sample consists of three East African countries, although previous studies assumed that these countries can be lumped together, we used a Chow-test to see if the countries can be pooled. By conducting the Chow-test, we tested whether the coefficients of the different country samples were equal to each other. Surprisingly, the Chow-test indicated that the co-efficient of the considered variables differ significantly between the countries. This is an interesting finding, because it indicates that the countries are not as similar as expected. This suggests that countries are contextually different from each other. It could be an explanation why previous studies found ambiguous results, due to contextual differences that were not taken into account. In our

study, we therefore decided to show the results of the regressions for each country separately to clearly point out the differences between countries.

RESULTS

For each country, we estimated a base model (model 1), including the control variables only. In the second model, we added the direct effects of the industry level characteristics. For each country we first show descriptive statistics and a correlation matrix (table 2, 3 and 4). For every country we tested for multicollinearity using VIF estimates after every regression. No high scores were found for Kenya and Tanzania. However, for Uganda the correlation matrix (table 4) shows a very high correlation between munificence and dynamism and munificence has a VIF score of 10.11, indicating a problem of multicollinearity. In order to solve the problem of multicollinearity, we estimated two separate regressions, one with dynamism and one with munificence. However, the results did not change, therefore we decided to include the model with both independent variables and use this model to interpret the results. The estimated results of all the models are presented in table 5. We base our interpretation of the findings on model 2, 4 and 6, which all have a better fit than the models with controls only.

In hypotheses 1 we proposed a positive relationship between dynamism and DCs. This hypothesis is supported by our analysis for Kenya, but we found the opposite result for Tanzania and an insignificant effect in Uganda. In Kenya, firms in environments with a higher dynamism have a significantly higher level of DCs than firms based in an industry with lower levels of dynamism. The coefficient of 0,481 indicates that an increase of 1 standard deviation in dynamism, increases the level of DCs by 0,481 standard deviation, which is a rather substantial effect, compared to the standardized coefficients of the other variables. In Tanzania, surprisingly, we found the opposite. Dynamism has a significant negative relationship with the level DCs, which is not in line with what we hypothesized in hypothesis 2. This could indicate that a firm is discouraged by dynamism to build DCs. The uncertainty related to dynamism

could have a paralyzing effect on firms instead of motivating a firm to develop DCs. In Uganda, dynamism has a negative coefficient, but is insignificant.

We expected a positive relationship between heterogeneity and the level of DCs (hypothesis 2), which is supported by our results in Tanzania and Uganda. In Tanzania, a higher level of heterogeneity within an industry relates to a higher level of DCs within a firm in that particular industry. In Uganda heterogeneity has the expected sign and is significant. It also has the largest coefficient, indicating that one standard deviation increase in heterogeneity results in almost one standard deviation increase in the DC sensing. However, this hypothesis is not supported by the results in Kenya. The sign of the coefficient has the expected direction, but is insignificant.

According to hypothesis 3, the higher the level of competition within an industry, the higher the level of DCs, which indicates a positive relationship. We find support for this hypothesis in all three countries, because the coefficient of this variable is positive and significant in all three models. Thus firms active in industries with more competition are indeed more inclined to have a higher level of DCs, indicating that a more competitive environment encourage firms to establish DCs.

The other industry variable, munificence, that we took as a control has mixed results. In Uganda (model 6), munificence has negative and significant effect. Yet, in Kenya (model 2) the results do not support the hypothesis. The coefficient of munificence is positive instead of negative, yet its effect is not significant. In Tanzania (model 4), munificence has a positive and significant relationship with. These mixed results suggests that country in which the firm is active also influences the relationship between munificence and DCs. The firm level controls do not show a clear pattern across the different countries. R&D is significant in Kenya, but not in Tanzania and Uganda, while size is only insignificant in Kenya. Training is the other control variable that is significant, but only in Tanzania.

The results indicate that the context of the country in which the firm is active influences the results. The East African region is not a homogeneous region, which can easily pooled together

considering the relationship between industry variables and the level of DCs. An explanation for these differences could be that the range of the independent variables differs between the countries. A country with a different range could show a different relationship between the independent and dependent variable. The range of dynamism overlaps between the three countries, indicating that this cannot be an alternative explanation for the different results across countries. For heterogeneity, the range for Tanzania is the widest, while for Kenya and Tanzania we found a smaller range. Thus also in this case, the range does not account for that we found an insignificant effect in Kenya and a positive and significant result in Tanzania and Uganda. Competition has a different range for every country, but the results are similar across countries. This indicates that for competition the range does not matter, at every part of the range of competition we find a similar result (see table 1,2 and 3). So, differences in ranges across countries do not explain the different results between those countries. Hence, we can rule out this alternative explanation.

DISCUSSION

This study establishes the importance of industry characteristics as drivers of DCs of firms in the East African region. More specifically, we proposed that environmental constructs influence the level of DCs. We suggested that certain industry characteristics create a need to be strategically flexible, which drives the development of DCs in firms. We tested these hypotheses empirically and found strong support that industry characteristics indeed drive the level of DCs.

This study contributes to the debate about drivers of DCs. Previous studies indicated that internal characteristics explain differences in levels of DCs of firms (Schilke, 2014a; Zahra et al., 2006; Zollo & Winter, 2002). Our focus was on the external factors driving the development of firm level capabilities, but we included internal characteristics as controls. Surprisingly, these were not as important as previous studies indicated. The environmental characteristics explained much more of the variation within the level

of DCs than internal characteristics. This indicates that in these East African countries, the external forces are extremely important as a driving factor for DCs compared to the traditional internal factors considered in previous studies. Makino et al. (2004) already suggested that country differences matter for the performance of foreign affiliates. They focus specifically on the difference between developed and developing countries and indicated that the external environment was more important for firms in developing countries. Our results further support the idea of the importance of the external environment.

More specifically, this study contributes to the debate about the external driving forces of DCs by indicating that not only environmental dynamism plays a role, but other environmental characteristics push the development of DCs as well. Dynamism has been indicated as a factor resulting in uncertainty and has been considered as a moderating or driving force of DCs in previous studies (Li & Lu, 2014). Yet, it is not the only industry characteristic that creates uncertainty, heterogeneity and concentration generate uncertainty as well. This uncertainty establishes a need for firms to be flexible and develop DCs. Our results show, for instance, that in Tanzania all the industry characteristics play a role in explaining different levels of DCs of firms. Yet, in Uganda, dynamism did not significantly contribute in explaining the different levels of DCs of firms, but the other industry characteristics did. Thus it is useful to include all these different industry characteristics when explaining differences in the development of DCs of firms.

Considering the results for dynamism in particular, we found opposing results. Theoretically, two opposing views exist upon the role of dynamism. As outlined by Peteraf et al., (2013) one view argues that the DCs are of particular value in dynamic environments (based on the work of Teece et al., 1997). The other stream of literature posits that DCs cannot be sustained in dynamic environments and that firms have to rely on simple rules in dynamic environments (based on the work of Eisenhardt & Martin (2000)). Unfortunately, our study does not solve this debate, because the results differ across countries. In Kenya we found evidence in favor of the arguments of Teece et al., (1997), while the results in Tanzania support the view of Eisenhardt & Martin (2000). It is an interesting finding that indicates that the results are

context dependent and that differences between countries account for the different associations between dynamism and the level of DCs of firms. Conceivably, the conflicting results found in previous studies are due to differences in the context, because our results indicate that the association between dynamism and DCs is context dependent.

Thus, the results indicate that the way in which industry characteristics influence the level of DCs differs across different contexts. This suggests that not only industry characteristics push the level of capabilities, but other context related factors influence the development of capabilities as well. Several possible explanations could account for this interesting result. First, we could consider the culture of the three different countries. Hofstede (2001) introduced an index to measure different aspects of culture, but this index is only available for Kenya and Tanzania. Yet, the index across these East African countries is fairly similar, there exists only a small difference between the score on masculinity. We expect that this cannot explain the different results.

Another explanation could be different historic paths of the countries. For instance, Tanzania has more socialistic roots compared to Kenya. Kenya focused on economic growth, while Tanzania's strategy was to increase equality (Barkan, 1994). This could explain why dynamism has opposing effects in these countries. In a socialist society, companies could be more risk averse, which could affect the way in which firms perceive dynamism and how they will act upon it. While in Kenya, firms are more used to dynamism and are more prone to deal with this dynamism by building DCs. Another explanations could point in the directions of different governmental policies. Different policies are at play, for instance regarding import and export taxes. Kenya focused on the West, while Tanzania tried to be self-reliant. Therefore, local policies in Tanzania supported local industries and tried to substitute imports (Barkan, 1994). This could influence the way in which firms react to their environment. The above lines of reasoning are still speculative and future research could study these other contextual factors in more detail to formally analyze how these influence the level of DCs of firms.

We are aware of the limitations of this paper. First, data limitations restricted our empirical analysis. Specifically, with the data available, we could not test a causal relationship between industry characteristics and DCs. Unfortunately, the dependent variable has only been measured in 2015, which makes it impossible to conduct a panel data analysis. Another option to test for causality, would be to develop an experiment or to construct a valid instrument. Future research could continue in this line of research to test for causality. Second, we tested our hypotheses in a very specific context, namely three developing countries. Future research could analyze if the results hold in different contexts as well.

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Table 1

Variables and data sources		
Variable	Measurement	Data source
Dynamic capability sensing	Average of 7-point likert scale answers to five items: 1) This establishment has extensive contact with researchers at universities. 2) This establishment has an active network of contacts with the scientific and research community. 3) This establishment regularly reads specialized journals and magazines to keep abreast of market and technical trends. 4) This establishment regularly conducts a technological audit. 5) This establishment monitors the needs of its clients and customers	Innovation Capabilities Survey - World Bank (not yet publicly available)
Dynamism	The standard error of the regression slope divided by the mean value of sales	Enterprise Survey 2007 - 2013 World Bank (enterprisesurveys.org)
Heterogeneity	Average of input and output heterogeneity, which was calculated by 1 minus the Herfindahl index of the value of purchases of inputs or outputs of other industries by an industry	Global Trade Analysis Project 2007 of the Purdue University (https://www.gtap.agecon.purdue.edu/)
Concentration	The share of firms within the total industry that indicated that the competitors was too many to count	Enterprise Survey 2013 - World Bank (enterprisesurveys.org)
Firm age	The natural logarithm of the number of years that the firm exists	Enterprise Survey 2013 - World Bank (enterprisesurveys.org)
Firm size	The natural logarithm of the total number of full time employees within the firm	Enterprise Survey 2013 - World Bank (enterprisesurveys.org)
Foreign ownership	Dummy variable coded as '1' if firm indicated that it is owned for more than 0% by private foreign individuals, companies or organizations and '0' otherwise.	Enterprise Survey 2013 - World Bank (enterprisesurveys.org)
R&D	Dummy variable, taken the value of '1' if the firm indicated to spend money on R&D in the last three years and '0' otherwise	Enterprise Survey 2013 - World Bank (enterprisesurveys.org)
Training	Dummy variable, taken the value of '1' if the firm indicated to offer formal training to its employees in the last year and '0' otherwise	Enterprise Survey 2013 - World Bank (enterprisesurveys.org)
Munificence	The coefficient resulting from regressing time against the industry sales divided by the mean value of the industry sales.	Enterprise Survey 2007 - 2013 World Bank (enterprisesurveys.org)

Table 2

Descriptive statistics and bivariate correlations Kenya

	Mean	St.Dev	Min	Max	1	2	3	4	5	6	7	8	9	10
1 Zidse	0,48	0,75	-2,07	2,88	1,00									
2 Lnsize	3,46	1,44	0,00	8,61	0,07	1,00								
3 Lnage	3,21	0,69	1,39	4,69	0,04	0,13	1,00							
4 Foreign	0,43	0,50	0,00	1,00	-0,06	-0,35	0,08	1,00						
5 RD	0,40	0,49	0,00	1,00	0,18	0,32	0,16	-0,12	1,00					
6 Training	0,49	0,50	0,00	1,00	0,19	0,31	0,14	-0,17	0,39	1,00				
7 Munificence	0,09	0,06	-0,08	0,21	0,14	-0,06	0,03	0,01	0,05	-0,01	1,00			
8 Dynamism	0,52	0,20	0,14	1,14	0,10	0,00	0,07	0,08	0,01	0,05	0,49	1,00		
9 Heterogeneity	0,71	0,07	0,64	0,87	0,02	0,12	-0,06	-0,20	-0,10	-0,08	-0,32	-0,51	1,00	
10 Competition	0,25	0,06	0,15	0,38	0,08	0,01	-0,09	-0,21	0,00	-0,09	0,05	-0,59	0,60	1,00

Table3

Descriptive statistics and bivariate correlations Tanzania

	Mean	St.Dev	Min	Max	1	2	3	4	5	6	7	8	9	10
1 Zidsel	-0,46	0,90	-2,47	2,66	1,00									
2 Lnsize	2,86	1,51	0,00	8,01	0,38	1,00								
3 Lnage	2,83	0,55	1,39	4,59	0,14	0,27	1,00							
4 Foreign	0,43	0,50	0,00	1,00	-0,12	-0,11	0,00	1,00						
5 RD	0,11	0,32	0,00	1,00	0,22	0,33	0,21	-0,10	1,00					
6 Training	0,30	0,46	0,00	1,00	0,02	0,23	0,19	-0,20	0,25	1,00				
7 Munificence	0,06	0,06	-0,05	0,12	0,11	0,01	0,12	0,10	0,04	0,08	1,00			
8 Dynamism	1,40	0,84	0,34	2,34	-0,13	-0,21	0,02	-0,14	-0,05	0,01	0,46	1,00		
9 Heterogeneity	0,61	0,11	0,36	0,74	0,00	0,11	-0,11	-0,17	-0,01	-0,03	-0,76	-0,45	1,00	
10 Competition	0,46	0,12	0,20	0,64	0,06	-0,11	0,01	0,01	0,12	0,18	0,43	0,60	-0,70	1,00

Table 4

Descriptive statistics and bivariate correlations Uganda

	Mean	St.Dev	Min	Max	1	2	3	4	5	6	7	8	9	10
1 Zidsel	-0,12	1,11	-2,71	2,88	1,00									
2 Lnsize	2,63	1,26	0,00	8,29	0,32	1,00								
3 Lnage	2,71	0,59	1,39	4,48	0,12	0,21	1,00							
4 Foreign	0,20	0,40	0,00	1,00	-0,10	-0,20	0,03	1,00						
5 RD	0,26	0,44	0,00	1,00	0,29	0,26	0,07	-0,14	1,00					
6 Training	0,31	0,46	0,00	1,00	0,12	0,25	0,06	-0,07	0,29	1,00				
7 Munificence	0,06	0,06	-0,02	0,14	-0,09	-0,21	-0,04	-0,05	0,01	-0,11	1,00			
8 Dynamism	0,62	0,57	0,09	1,57	-0,08	-0,14	-0,01	-0,08	0,01	-0,03	0,91	1,00		
9 Heterogeneity	0,78	0,04	0,68	0,87	0,14	-0,05	-0,07	-0,06	0,16	-0,20	0,37	0,19	1,00	
10 Competition	0,71	0,10	0,60	0,90	-0,08	-0,01	-0,05	-0,06	-0,01	0,01	0,65	0,76	-0,31	1,00

Table 5

	Kenya				Tanzania				Uganda			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Control variables												
Lsize	-0.006	(0.078)	-0.014	(0.074)	0.277	(0.071)	0.238***	(0.066)	0.301*	(0.139)	0.239*	(0.109)
Lnage	0.000	(0.064)	0.003	(0.067)	0.033	(0.086)	0.080	(0.101)	0.061	(0.068)	0.103	(0.055)
Foreignowned	-0.020	(0.052)	0.005	(0.057)	-0.081	(0.086)	-0.110	(0.085)	-0.040	(0.055)	-0.036	(0.063)
R&D	0.082*	(0.039)	0.089**	(0.041)	0.138	(0.091)	0.065	(0.111)	0.273**	(0.108)	0.206	(0.113)
Training	0.106	(0.063)	0.116	(0.068)	-0.105	(0.040)	-0.171**	(0.054)	-0.012	(0.218)	0.061	(0.211)
Munificence	0.104**	(0.045)	0.044	(0.060)	0.098	(0.087)	0.335***	(0.076)	-0.0526	(0.094)	-0.367**	(0.179)
Independent variables												
Dynamism			0.481**	(0.189)			-0.224***	(0.053)			-0.024	(0.191)
Heterogeneity			0.078	(0.083)			0.313*	(0.139)			0.930**	(0.277)
Competition			0.415*	(0.195)			0.658*	(0.305)			0.605**	(0.238)
Adjusted R-square	0.040		0.047		0.142		0.216		0.116		0.131	
ΔF			3.66**				7.08***				7.95**	
N	201		201		136		136		147		147	

a: Robust standard errors in parentheses

* p < .10

** p < .05

*** p < .01